

UNITED STATES MARINE CORPS
Logistics Operations School
Marine Corps Combat Service Support Schools
Training Command
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FESCR 8106

STUDENT OUTLINE

REPAIR LEECE-NEVILLE
A0013428JC 65 AMP ALTERNATOR ASSEMBLY

LEARNING OBJECTIVES

1. Terminal Learning Objective: Given a Leece-Neville Model A0013428JC 65 amp alternator assembly, the required common and special tools, test equipment, repair parts, shop supplies, and TM 9-2320-297-34, per information contained in the reference, repair the alternator assembly.
2. Enabling Learning Objectives: Given a Leece-Neville Model amp A0013428JC 65 amp alternator assembly, the required common and special tools, test equipment, repair parts, shop supplies, and TM 9-2320-297-34, per information contained in the reference:
 - a. Disassemble the alternator.
 - b. Inspect the components of the disassembled alternator to determine their suitability for reuse.
 - c. Test the components of the disassembled alternator for serviceability.
 - d. Repair or replace the unserviceable components as required.
 - e. Assemble the alternator from serviceable components.
 - f. Test the alternator on an appropriate test bench.

1. NOMENCLATURE AND DESCRIPTION OF THE MAJOR COMPONENTS OF THE ALTERNATOR ASSEMBLY

- a. This alternator assembly consists of six main components that are incorporated in all alternators that you will repair. You will also find that their functions are the same.

(1) The rotor assembly consists of two iron pole pieces with interlacing fingers mounted over many turns of wire. These wires are wound over the rotor core, which is mounted, on the shaft. The rotor coil is connected to two slip rings. The rotor carries the magnetic field of the alternator.

(2) The brushes are graphite rods, which are pushed against the slip rings by spring pressure. They provide a low resistance electrical connection between the field winding and its power source.

(3) The slip rings are two metal rings mounted on the opposite end of the rotor shaft from the pulley. One end of the field coil is attached to each slip ring.

(4) The stator is a number of conductors mounted on a laminated iron frame. The conductors collect the voltage and provide a path for current to flow. The stator winding consists of three connected coils. Stators can be connected in one of two ways:

(a) Wye connected. This type of connection is used in light duty automotive alternators.

(b) Delta connected. This type is used in heavy-duty automotive alternators. Most military vehicles use the Delta wound stator.

(5) This alternator contains a solid state voltage regulator. It is non-repairable. It is used to control the output of the alternator. This voltage regulator can be adjusted by moving the voltage adjust screw in the regulator, to increase and decrease voltage.

(6) The alternator has two rectifier assemblies. The positive and negative rectifiers have three diodes. The diodes are considered to be electric check valves, in that they only let current flow in one direction. The diodes also change alternating current generated by the alternator to direct current. The stator leads are hooked to the rectifier assemblies.

b. As stated, the six components we have covered will be found in all the alternators you will be receiving training on. All other components will be covered during each lesson as they relate to the alternator being covered at that time.

2. PRINCIPLES OF OPERATION FOR THE ALTERNATOR ASSEMBLY

a. Function. The alternator is a device that converts mechanical energy into electrical energy. In the case of an automotive alternator, it takes a portion of the rotary mechanical energy from the engine and converts

it into electrical power to charge the batteries and energize the electrical equipment in the vehicle.

b. Electromagnetic Field. When electrical current flows through a coil of wire, a magnetic field is formed around the coil of wire. The field is much stronger if the coil is wound around an iron core, forming a device called an electromagnet. The field is made up of magnetic lines of force, which flow from the north pole to the south pole.

c. Voltage Generated. When a loop of wire moves within a magnetic field, a voltage is generated across it. If the ends of the loop are connected by a lead of some kind, a current will flow through it. The amount of current produced is determined by the rate at which the lines of force are cut by the moving wire loop.

d. To sum up the operation of an alternator, the rotor receives current from an outside source, such as the vehicle batteries, through the regulator, brushes and slip rings. The current in the rotor, (field windings) causes a magnetic field to be produced around the rotor. As the rotor rotates, the magnetic field is cut through or crossed by the windings of the stationary stator. This action generates AC current at the output terminals of the stator. The current is then changed to DC current by directing it to the rectifier or rectifiers containing the diodes, which only allow current to flow in one direction, therefore giving us DC current. The current is then directed through the voltage regulator.

3. DEMONSTRATION AND PRACTICAL APPLICATION ON THE LEECE-NEVILLE MODEL A0013428JC 65 AMP ALTERNATOR ASSEMBLY

a. Disassembly of the Alternator

(1) Place pulley in vice and break torque on lock nut, remove the lock nut and pulley.

(2) Remove fan, key, and fan spacer from alternator assembly.

(3) Remove four capscrews, washers, and lockwashers securing the brush cover.

(4) Remove brush cover, gasket, and brush holder.

(5) Remove brushes and o-ring from brush holder.

(6) Remove three lock nuts from capscrews and remove capscrews.

(7) Separate drive end housing from slip ring end housing, ensuring

that the stator remains with slip ring end housing.

(8) Remove three lockouts from stator leads and remove stator from slip ring end housing.

(9) Remove three capscrews and disconnect two red leads and one black lead from rectifiers.

(10) Remove nut, lock washer and nut from positive terminal stud.

(11) Remove nut, lock washers, and nut from negative terminal stud.

(12) Remove positive and negative terminal studs from rectifiers.

(13) Remove two screws, lock washers, and insulating washers securing rectifier assemblies to slip ring end housing.

(14) Remove three rectifier eyelet terminals connecting rectifiers to terminal studs and remove the rectifiers from slip ring end housing.

(15) Remove two insulating bushings from the rectifiers.

(16) Remove two insulators and insulating bushings from slip ring end housing.

(17) Remove two screws from the regulator connector.

(18) Remove three yellow leads from terminal studs in slip ring end housing.

(19) Remove three nuts and lockwashers from terminal studs on the outside of the slip ring end housing.

(20) Remove three nuts and washers from terminal studs on the inside of the slip ring end housing.

(21) Remove three terminal studs.

(22) Remove two screws from brush adapter and gently pull out of slip ring end housing and remove fiber plate.

(23) Carefully remove the brown and red leads from adapter.

(24) Pull red and brown leads through hole and into slip ring end housing. Ensure the grommet comes through with the leads.

(25) Remove the regulator connector and holder from slip ring end housing.

(26) Remove four cap screws, cover and seal ring from rear of slip ring end housing.

(27) Insert a punch through access holes in slip ring end housing, and drive out bearing and two oil seals.

(28) Place the drive end housing in a press, rotor side down and press out rotor.

(29) Remove four screws from bearing retainer in drive end housing and remove retainer.

(30) Remove oil seal and using press, press out bearing.

(31) If needed, to remove slip ring assembly and/or inner bearing race from rotor perform the following.

(a) Heat two terminals with a soldering iron and unwrap the rotor leads.

(b) Using a puller, remove the slip ring assembly from rotor.

(c) Using a puller, remove the inner bearing race from rotor.

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b. Cleaning.

(1) Caution to prevent damage to parts, do not use solvent or paint thinner to clean parts.

(2) Clean all parts in accordance with technical manual.

c. Inspection.

(1) Perform Positive Rectifier Test

(a) Set you multimeter at the diode scale.

(b) Test the positive rectifiers.

(c) Replace the rectifier if defective.

(2) Perform Negative Rectifier Test

- (a) Set your multimeter to diode scale.
- (b) Test the negative rectifier.
- (c) Replace the rectifier if defective.

(3) Perform Stator Test

- (a) Set your multimeter to ohms scale.
- (b) Connect test leads to stator leads in the following order: (a-b), (b-c), and (a-c). Check stator for continuity.

(4) Test the Rotor

- (a) Set multimeter to k-ohms setting.
- (b) Connect one test lead to the inner slip ring.
- (c) Connect the other test lead to the outer slip ring.
- (d) Reading should be a 12.5-13.5 ohms.
- (e) If reading is not correct replace rotor.

(5) Measure the Rotor

- (a) Using micrometer measure two slip rings on rotor, minimum diameter is 0.767 inch.
- (b) Using micrometer measure slip rings for out of round. (To do this measure two points on the slip ring 90 degrees apart.)
- (c) Measure inner bearing race on rotor. Minimum diameter is 0.8709 inch.

(6) Brushes

- (a) Inspect brushes for physical damage.
- (b) Measure brushes, they must be a minimum of 0.187 inch.

(7) Perform continuity check on all leads

(a) Set multimeter to continuity scale.

(b) Check for continuity between the regulator connector and end of all leads.

NOTE: Replace all parts failing inspection.

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d. Reassemble the Alternator

(1) Press bearing into drive end housing with the open side of bearing facing inside of drive end housing.

(2) Install oil seal into bearing retainer so that flat side of oil seal fits flush with the flat side of bearing retainer.

(3) Fill cavity of oil seal with lubricating grease.

(4) Install bearing retainer into drive end housing. Secure with four screws.

(5) Install rotor leads into the groove on rotor shaft.

(6) Place rotor in press and install the inner bearing race, chamfered side toward end of shaft. Be careful not to damage rotor leads, press inner bearing race onto shaft until it is .140 inch from nut.

(7) Apply high temperature adhesive to the rotor shaft and press on slip ring assembly.

(8) Position rotor leads as in technical manual and solder to slip ring terminals.

(9) Cut off terminals at 1/8 inch from end of shaft

(10) Place rotor in press and install the drive end housing over drive end.

(11) To avoid damage press on the race of bearing only.

(12) Pressing on inner race of bearing, press drive end housing onto rotor.

(13) Install oil seal into slip ring end housing. Position flat side towards outside of slip ring end housing.

(14) Fill cavity of oil seal with lubricating grease.

(15) Place slip ring end housing in press with open side up.

NOTE: To avoid damage, press only on the outer race of bearing.

(16) Press bearing into slip ring housing until flush with inner edge and pack bearing with grease.

(17) Apply grease to new oil seal, and install into slip ring end housing until flat side of oil seal is flush with slip ring end housing.

(18) Install regulator connector into holder with yellow leads toward rear of holder. Route leads through hole in rear of holder.

(19) Insert three terminal studs into holder. Make sure that the square part of the stud seats in the holder.

(20) Install three new lock washers and nuts.

(21) Install three new lockwashers and nuts onto rear of terminal studs.

(22) Install two screws to secure regulator connector to holder.

(23) Install insulating bushings into slip ring end housing. Make sure that $\frac{1}{4}$ inch diameter bushing goes into the negative hole and that the 5/16-inch inside diameter bushing goes into positive hole.

(24) Install new lock washer, flat washer, and insulator washer onto screw.

(25) Install insulating bushing into negative rectifier from backside and install screw assembly through insulating bushing from front of negative rectifier.

(26) Apply low viscosity adhesive to threads of screw and install negative rectifier into slip end housing. Do not tighten.

(27) Apply electrical joint compound in and around square hole in negative rectifier and install negative rectifier into hole and tighten screw.

(28) Repeat previous steps to install positive rectifier, ensuring you use the 5/16 bushing.

(29) Install insulators onto the rear of positive and negative terminals.

(30) Route regulator connector leads through opening in slip ring end housing and install holder onto slip ring end housing.

(31) Install nuts onto positive and negative terminals.

(32) Install two new lockwashers and nuts and onto terminals and tighten finger tight.

(33) Route red and brown leads through access hole in slip ring end housing.

(34) Push connectors of red and brown leads into brush adapter. Make sure leads are in the proper locations.

(35) Install brush adapter and fiber plate into slip ring end housing using two screws.

(36) Temporarily install brushes and brush holder onto slip ring end housing. Looking through the hole in the rear of slip ring housing, making sure that only enough wire is left inside brush cavity to clear brushes.

(37) Remove brush holder and brushes.

(38) Push grommet into access hole in slip ring end housing.

(39) Install two red leads onto positive rectifier at there proper location and secure with two screws

(40) Install three yellow leads from regulator connector onto terminal studs.

NOTE: If either positive or negative rectifier has been or is being replaced, leads from rectifiers will be separated. If original rectifiers are being re-used, leads may be joined at eyelet connectors.

(41) Install eyelet terminal from negative rectifier to terminal studs. Install top eyelet terminal to right stud, center eyelet terminal to center stud, and route bottom eyelet terminal under bearing and connect to left stud.

(42) Install eyelet terminal from positive rectifier to terminal studs. Install top eyelet terminal to left stud, center eyelet terminal to center stud, and route bottom eyelet terminal under bearing and connect to right stud.

NOTE: Ensure that all eyelets are installed with the flat sides up.

(43) Install stator onto slip ring end housing. Make sure stator leads are on the terminal studs.

(44) Install three new lock nuts onto terminal studs and tighten lock nuts.

(45) Paint all internal terminals with red epoxy. Do not allow paint to get on oil seals or bearing.

NOTE: When installing rotor and drive end housing onto stator and slip ring end housing, be careful not to damage seals with slip rings on rotor. Also ensure that the bearings in slip ring end housing are seated in outer bearing race.

(46) Carefully install rotor and drive end housing onto stator and slip ring end housing.

(47) Align drive end housing with slip ring end housing as shown in technical manual.

(48) Install three D-washers and capscrews through drive end housing, stator, and slip ring end housing and install and tighten three nuts.

(49) Install two brushes into brush holder and install brush cover and gasket onto brush holder.

(50) Install new o-ring onto brush holder and install assembly into slip ring end housing.

(51) Install four washers, new lock washers and capscrews and secure brush holder to slip ring end housing.

(52) Install new seal ring and rear access cover and secure with four capscrews.

(53) Install fan spacer, key and fan.

(54) Install key and pulley on rotor shaft and secure with lock nut and torque to 80-ft lbs.

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d. Test the Alternator on the Alternator/Generator/Regulator/Starter/ (AGRS) Test Stand.

NOTE: An instructor will be at your test stand to provide you with individual instructions and assistance.

(1) Install alternator on test stand.

(a) Position the alternator on the test stand mounting bracket pins and secure it in place, using the pin bracket crank. Connect the top holding bracket to the top mount of the alternator.

(b) Install 3VX475 belt on the test stand and alternator pulleys. Align the belts and adjust their tension by turning the two bracket table cranks.

(c) Connect cable 1507 to the 100-amp alternator cannon connector and the 0-36 VDC 20A power supply cannon connector on the test stand. Connect the 24 VDC lead to the positive terminal on the alternator. Connect the negative lead to the negative terminal on the alternator. Use cable 1527 as a jumper to connect the ignition lead from the alternator to the small lead from the 24 VDC positive connection.

(2) Adjust the speed sensor.

(a) Make sure the louvers are in the open position and that all five air inlets on the test stand are open.

(b) Turn the test stand main power switch to the ON position. Turn the control power switch, located on the lower right side of the control panel, to the ON position.

(c) Adjust the speed sensor until you have a defined red dot on the reflector. Rotate the drive pulley by hand to see if the RPM register on the pulley drive RPM meter. If they do not register, readjust the sensor and recheck.

(3) Perform the alternator output test.

NOTE: The UUT (unit under test) cover must be in the down position before the drive will operate.

(a) Turn the UUT voltage switch to the 24V position. The 24-volt load bus voltage green indicator light should be on at this time.

(b) Turn the UUT ground polarity switch to the NEG position. The bus grounding negative green indicator light should be on at this time.

(c) Turn the drive motor rotation switch to the CCW position. The drive motor CCW green indicator light will start blinking.

(d) Turn the drive motor switch to the START position. The load bank fan, glycol coolant pump, and the DRV MTR lube pump green indicator lights should be on at this time.

(e) When the drive motor green indicator light stops blinking, turn the drive motor speed adjust until the pulley drive RPM meter reads 2500 RPM.

(f) If the alternator does not self-excite, as indicated by the 24 volt Gen/Alt volts meter, turn the DC power supply switch to the ON position and adjust the DC power supply volts SLOWLY until the 24 volt Gen/Alt volts meter reads 28 volts \pm 1 volt. As soon as this occurs, return the DC power supply controls to the OFF position.

1 If the volts are low or high, you must shut down the test stand and make an adjustment. Remove regulator and reposition adjust screw located on the alternator regulator.

2 If the 28 volts \pm 1 volt cannot be obtained, the regulator will have to be replaced.

(g) With the 8 load steps rotary switches in the OFF position, turn the load bank control switch to the ON position.

(h) Slowly apply a 65-amp load, utilizing the 24-volt load steps rotary switches as applicable. The amps will be read on the 24-volt Gen/Alt amp meter.

1 If specifications are met, the alternator is serviceable.

2 If the 65-amp load cannot be obtained or maintained, the alternator is defective and must be repaired.

3 If, when the load is applied, the regulator does not hold the volts within the specifications, the alternator is defective and must be repaired.

(i) Return all load bank controls to the OFF position.

(j) Turn the drive motor speed adjust down to zero and the drive motor switch to the STOP position. The blower fan will continue to run for a one minute cool down time.

(k) After the blower stops, turn the control power and test stands main power switches to the OFF position.

(l) Remove the alternator from the test stand and return the cable assembly to its original location.

REFERENCES:

TM 9-2320-297-34

TM 9-2320-297-24P